ROCKY FLATS PLANT, PLUTONIUM LABORATORY
(Building 779)
North-central section of industrial area at 79 Dr.
Golden vicinity
Jefferson County
Colorado

HAER No. CO-83-C

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PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD
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ROCKY FLATS PLANT,
PLUTONIUM LABORATORY HAER No: CO-83-C
(Rocky Flats Plant, Building 779)

Location: Rocky Flats Environmental Technology Site, Highway 93, Golden, Jefferson County, Colorado. Building 779 is in the north-central section of the industrial area of the Rocky Flats Plant (Plant).

Significance: This building is a secondary contributor to the Rocky Flats Plant historic district, associated with the U.S. strategy of nuclear military deterrence during the Cold War, a strategy considered of major importance in preventing Soviet nuclear attack on the U.S. In the early 1960s Rocky Flats Plant became the sole producer of plutonium triggers and research and development activities increased markedly. Laboratories were established for each of the three manufacturing buildings, specializing in the material of the plant, either plutonium, enriched uranium, or depleted uranium. Building 779 was built to provide additional research and development capabilities to support plutonium production and recovery processes.

Description: Building 779 is an irregular-shaped, two-story, flat-roofed building constructed of concrete block on concrete footings. A one-story, metal-sided ell extends to the north. The doors are steel or steel with safety glass; the windows, on the south wall only, are single panes in metal sash. There is a second floor passage to Building 776/777 (plutonium fabrication and assembly) on the west side. Building 779 has nearly doubled in size since it was built in 1965, with two major additions in 1968 and 1973. The first addition, the larger of the two, provided office and laboratory space, plus an environmental storage facility for product aging studies under various environmental extremes, and a storage vault. A filter plenum facility (Building 729) was also constructed in 1973 next to Building 779 and linked by a second-story bridge for the ducting. The new plenum facility served as the second addition to the main building and housed an emergency generator. A year later, a new filter plenum facility was added o the East End of 779 to serve the original building and that portion added in 1968. A structural upgrade was completed in 1988 to provide added resistance to damage from earthquakes and high winds. The building is 67,710 square feet.

History: In the early years of nuclear weapons production at the Rocky Flats Plant, most of the research and development functions were handled by the three laboratories associated with the Nuclear Weapons Complex: Los Alamos National Laboratory in New Mexico, Lawrence Livermore Laboratory in northern California, and Sandia National Laboratory in New Mexico and California. Any research done at the Rocky Flats Plant was incorporated into production engineering for new weapons design. When the Rocky Flats Plant became the sole producer of plutonium triggers (early 1960s); research and development activities and funding increased markedly. Laboratories were established for each of the three manufacturing buildings, specializing in the material of the plant, either plutonium (Building 771), enriched uranium (Building 881), or depleted uranium (Building 444). Building 779 was built in 1965 to provide

additional research and development capabilities to support plutonium production and recovery processes.

The specific purpose of this facility was to gain more knowledge of the chemistry and metallurgy of plutonium and its interactions with other materials, which might be used in the manufacturing process. Although some of the processes in the building changed over the years, the primary purpose of the activities did not. Most of the materials used in this facility were the same as those in the plutonium manufacturing buildings, and much of the work conducted involved improvement of existing processes and understanding the materials employed. Research, development, and support operations were divided into five areas of responsibility: process chemistry technology; physical metallurgy; machining and gauging; joining technology; and hydriding (plutonium recovery) operations.

The Process Chemistry Technology group supported plant production, manufacturing, and assembly operations. The process chemistry laboratories engaged in weapons process development, stockpile reliability testing, testing of various materials compatibilities, plutonium aging under various environmental conditions, and methods development for recovering, separating, and purifying actinides from waste streams and residues. The Physical Metallurgy group, which included tensile testing, study of casting dynamics, electron microscopy, X-ray analyses, hardness testing, and dimensional dynamics, conducted research on various metals, alloys, and material required by plant missions. This group also supported different research groups, design agencies, plant production, and other metallurgy studies. The Machining and Gauging group, which involved manufacturing of special order parts and test components, had two shops and a laboratory for tool making, maintenance operations, and high-precision machining for special orders and tests. The Joining group, which involved methods such as welding and brazing, developed sophisticated joining techniques for nuclear materials.

Building 779 was also used to find new ways to recover plutonium and associated actinides. The Hydriding group was involved in plutonium recovery experiments. During plutonium processing, significant amounts of plutonium would coat on metallic and non-metallic substrates such as crucibles, tools, and equipment. These crucibles needed to be re-used in certain operations. For many years, the sole method available for recovery of plutonium from these substrates was acid dissolution, which in some cases damaged the substrate. The nonaqueous hydriding process was developed in order to effectively remove and recover plutonium without damage to the substrates. In addition to this main advantage, the hydriding process involved relatively few process operations and generated very little waste. These features resulted in fewer material accountability problems and reduced the potential for personnel radiation exposure. It was soon discovered that plutonium could also be recovered from non-valuable or discardable substrates. A decision was made in early 1971 to design a production prototype hydriding apparatus. The prototype hydriding apparatus was constructed in Building 779A and went on line in April of 1972.

Research in Building 779 also improved the pyrochemical process for plutonium purification, one of the main plutonium recovery operations. Pyrochemical processing included molten salt extraction and electrorefining processes. Molten salt extraction and electrorefining were used for plutonium recovery from site return materials and scraps, while other processes were used for recovery from residues and oxides. As much plutonium as possible was recovered from site returns (dated weapons) and manufacturing scraps, since the material was extremely expensive, difficult to obtain, and highly controlled for national security reasons.

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Historians: D. Jayne Aaron, Environmental Designer, engineering-environmental Management, Inc. (e^2M), 1997. Alexandra Cole, Architectural Historian, Science Applications International Corporation, 1997.